Instructrions for Writing Up Lab Results

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Contents

Introduction

You have done several structured labs that provided opportunities to learn about R, RMarkdown, and several different aspects of climate science (data analysis and several computer models).
For the next few weeks, you will have a chance to utilize the skills you have learned thus far in lab to take one of the previous labs you have worked on and dig more deeply into the details, and develop it into a formal report about a particular aspect of climate change. This series of labs consists of creating a detailed written lab report in RMarkdown.

For this project, you will choose a lab you worked on before and explore it more deeply, doing some library research on the topic and connecting that with your computational analysis. Your analysis should begin with the work you did for the original lab, but dig into the details of how you draw conclusions from the data you analyzed.

Solo or Team Projects

You may choose to do this project individually or with a partner as a team effort. If you work with a partner, you may work together to design the question, obtain and analyze data, and write a report together. We expect teams to include a note in the report that indicates which member contributed what to the report (this does not need to be super detailed and can say, "Alice and Bob designed the experiment together. Bob wrote the code to run the models. Alice wrote the code for the data analysis. Alice and Bob contributed equally to writing the discussion and conclusions.") This is similar to the requirement at many research journals that co-authored papers include a statement of what each author contributed.

Choosing a Topic

For undergraduates, we recommend that you choose a topic from one of the exercises that you did in labs #2–5 and think of a way to go a little more deeply into the topic of the questions that exercise asked. What I am looking for is not for you to investigate a brand new question or research topic, but for you to focus on the details of the exertise you did and think about how to present it to the reader, explaining in clear prose how you used data to answer a question about the climate.

For graduate students, we expect you to try something more ambitious than just simple extensions of the questions from the lab exercises, but it is still fine to take one of the lab exercises as a starting point.

If you want to do something really different than what we have done previously in lab, that is fine. But check with one of us to make sure your plan is appropriate and feasible (we don't want you to bite off more than you can chew). Just writing up the details on one of the lab exercises should be plenty of work.

Be creative! Now is the time to really explore parts of the class that you have found interesting and present your findings in a unique, exciting way.

Writen Report (Due Apr. 1)

Your report should be comprehensive, yet not overly verbose. One recommendation for achieving this is to create an outline to organize your thoughts before initializing writing and data analysis. The report needs to include the following components:

- Introduction
  - *Provide background information that frames the problem you are addressing (e.g., an exercise from one of the previous labe). At the end of the introduction, the reader should understand exactly* ***what the problem is*** *that you are addressing and why that problem is* ***interesting*** *and* ***relevant*** *to the climate system.*
- Methods
  - *Describe the methods for answering your question. The methods section should be written such that someone who doesn't know about your project could follow your steps and recreate your results.*
  - This section should contain the R code you use to do the analysis:
    - Identifying the sources of data: what data did you use (observations, model output, etc.), and why is that data useful for addressing your research problem.
    - How did you get your data into R? Did you download from the internet, read it in from files on your computer, run models, etc.
    - How did you process your data to clean it up? Describe what your R code did to manipulate the data to make it easier to analyze. Think of how you used functions like `mutate`, `gather`, `summarize`, etc. to convert the data into a useful form.
    - How did you analyze data? What did you do to analyze the data, such as generating descriptive statistics like the mean or standard deviation, fitting linear models to get slopes (rates of change), etc.
  - The R code does not speak for itself, so describe what you did in words. Don't tell the reader every little detail, but present a clear overview of the big picture of how you obtained, cleaned, and analyzed your data. If there were particular challenges or difficulties, briefly describe them.
- Results
  - *Describe the results of your analyses. Include apropriate charts, tables, graphs, and other quantitative representations of data.*
  - This section should have R code for making graphs, tables, etc.
- Conclusions/Discussion
  - *Discuss how you drew conclusions from your analysis.*
    - What conclusions can you draw from your results about the research question or questions?
    - How does the data (and your analysis of it) support those conclusions?

- Works Cited
  - *Include a works cited section to credit the research and thoughts that are not your own. Be sure to use citations throughout your report where necessary.*
  - I will post a separate document that explains how to do citations and bibliographies in RMarkdown.

Final reports are to be pushed to your Lab 8 Github repository *no later than 11:59 PM on Apr. 1*. **You must push the .Rmd file *and* the knitted PDF** to Github. A portion of your final report grade will reflect effective use of R/RMarkdown/Github, the clarity and succinctness of your writing, visual representations of data, appropriate discussion of results, and insights into future analyses.